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CHAPTER 6
CONSTRUCTION

600 GENERAL

All work shall be performed in a workmanlike manner and in accordance with good usage and accepted practices. All materials shall be made and installed so they perform in accordance with their intended purposes.

602 SITE

602-1 SITE UTILITIES - UNDERGROUND UTILITIES

602-1.1 Underground piping and related items shall be protected from corrosion. Underground mechanical and electrical systems shall be protectively coated to minimize corrosion where soil conditions warrant. Where applicable, sacrificial anodes may be used.

602-1.2 Sacrificial anodes may be used where soil resistivity does not exceed 15,000 ohm - centimeters. Otherwise, an impressed current system of corrosion prevention shall be used.

602-2 ROADS AND WALKS

602-2.1 GENERAL

Surfaces and base courses for roads, streets, parking areas and walks shall be durable materials. Their construction shall be in conformance with generally accepted local design practices.

602-2.2 Drainage

Adequate surface and underground drainage systems shall serve all paving and improvements so as to ensure continuing stable soil support for these improvements.

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603 CONCRETE

603-1 INTERIOR CONCRETE SLABS-ON-GROUND

603-1.1 General

Slabs shall be designed and constructed in accordance with ACI 302.1R-80, Guide for Concrete Floor and Slab Construction, and as may be necessary to prevent slab damage due to potential soil movements.

603-1.2 Vapor retarders and base course shall be provided for all interior concrete slabs to which a finish flooring is applied. In arid regions where irrigation and heavy sprinkling is not done, and where no drainage or soil problem exists on the site, vapor retarders may be omitted with the consent of the HUD Field Office. Base course may omitted when asphalt tile, rubber tile, vinyl tile, terrazzo and ceramic tile are used as finish flooring, except that base course shall be used when capillarity of subsoil is such that liquid rise from ground water table will permit water to reach the bottom of the slab.

Note: Acceptable base course materials are gravel, slag, crushed rock, sand, cinders and certain types of earth when approved by the local HUD Field Office. See ASTM C-33-90, Table 2. Base course material shall be clean, washed and free from deleterious substances, consistent with ASTM C-33, with 100% of the material passing a 1" sieve and less than 2% passing a #4 sieve.

603-2 EXTERIOR CONCRETE SLABS-ON-GROUND

Slabs shall be designed and constructed in accordance with ACI 302.1R-80, Guide for Concrete Floor and Slab Construction, and as may be necessary to prevent slab damage due to potential soil movements.

606 WOOD

606-1 TERMITES PROTECTION

606-1.1 A chemical barrier must be provided for structures built in those areas where termites are determined by the HUD Field Office to be a hazard. A physical barrier will also satisfy this requirement where the hazard is presented by subterranean termites only.

606-1.2 Soil treatment and pressure treated lumber are chemical barriers.

606-2 DECAY PROTECTION

606-2.1 Protection Against Damage by Decay

Where required by the HUD Field Office, protection against damage by decay shall be provided.

606-3 WOOD CONSTRUCTION

The 1991 Edition of the National Design Specification for Wood Construction shall be used, including the 1991 supplement.

607 THERMAL AND MOISTURE PROTECTION

607-1 ENERGY REQUIREMENTS

607-1.1 Energy Efficiency

All buildings shall be constructed in compliance with the requirements of the CABO Model Energy Code, 1992 Edition except Sections 101.3.1, 101.3.2, 101.3.3 and 502.1.2, but including the Appendix. The values to be used for the table contained in Section 302.1 of the Model Energy Code are to be those for the area in which the building is to be constructed. Information concerning heating and cooling degree days for particular locations shall be obtained from the ASHRAE Handbook of Fundamentals; ASHRAE Heating Cooling Load Calculations Manual; the NAHB-RF Insulation Manual for Homes and Apartments; local utilities; or the National Climatic Data Center Manuals are available from NAHB-RF, or NAIMA.

Other sources of heating degree day and summer cooling data may be used, if acceptable to the HUD Field Office.

607-1.2 Thermal Mass

In addition to the energy criteria set forth in Section 607-1.1, the design of a property may take into consideration the thermal mass of building components. However, thermal mass may be considered only to the extent that the developer or other interested party can

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607-1.2 Continued

provide the HUD Field Office with empirical evidence that quantifies the effect of thermal mass with respect to the specific geographical location in question and with respect to the specific type of construction in question. When the quantifiable effects of thermal mass are considered, the building must provide a level of energy efficiency equal to or exceeding that otherwise required by these MPS.

607-2 FLASHING

General

- a. Flashing shall have a service life at least equal to that of the assemblies into which it is built.
- b. Alternate products or systems of bitumen-impregnated plastic or elastomeric materials may be used for flashing if they are installed in accordance with the manufacturer's recommendations and are acceptable to the HUD Field Office. Counter flashing is considered exposed flashing and shall be constructed of sheet metal.
- c. All openings between wood or metal and masonry shall be caulked with a non-hardening caulking compound.

607-3 GUTTERS AND DOWNSPOUTS

607-3.1 Gutters

- a. Gutters shall be provided when either of the following conditions are present:
 - (1) Soil is of such a nature that excessive erosion or expansion will occur or,
 - (2) Roof overhangs are less than 12 inches in width for one story structures or less than 24 inches in width for two story structures.
- b. When gutters are omitted, a diverter or other suitable means shall be provided to prevent water from roofs or valleys from draining on uncovered entrance platforms or steps.

607-3.1 Continued

- c. A gutter having approximately the same cross section as the downspouts shall be used for spacings of up to 40 ft. between downspouts. For each additional 20 ft. of gutter, the gutter width shall be increased by 1 inch.
- d. Strainers shall be installed at the head of the downspout when the downspout is connected to an underground drain.
- e. Details of any built-in gutters shall be submitted to the HUD Field Office for acceptance.

607-3.2 Scuppers

- a. Scuppers shall be installed at the outfall end of a valley for special roof designs, such as "butterfly" roofs.
- b. Scuppers shall be installed for overflow of all roofs enclosed by parapet walls, except when the construction of the roof and the type of roof covering used are designed to hold water. Suitable overflow devices shall be used.

607-3.3 Downspouts

Downspouts shall be sized on the basis of 100 square feet of roof surface to 1 square inch of leader. More or less leader area may be required by the HUD Field Office.

608 DOORS, WINDOWS, AND GLAZING

608-1 DOOR PERFORMANCE - GENERAL

Doors shall be durable, installed in good operating condition, free of defects, latch readily and lock securely.

608-2 EXTERIOR DOORS

608-2.1 Weatherstripping

All exterior doors and weatherstripping shall be properly fitted so as to eliminate excessive infiltration of air.

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608-2.2 Miscellaneous

A safety door check shall be provided on all outward opening doors, including storm and screen doors.

608-3 WINDOWS

608-3.1 Installation

Windows shall be installed in accordance with the recommendations of the manufacturer. Operating hardware shall be installed. Windows in buildings of 4 or more stories in height shall be inside glazed or have sash or ventilators that can be glazed from the inside of the building. All glass and glazing beads shall be replaceable.

608-3.2 Weatherstripping

Windows and weatherstripping shall be properly fitted to eliminate excessive infiltration of dust, snow or rain.

608-3.3 Screens

Screens shall be installed on openable windows in habitable rooms and bathrooms.

608-4 GLAZING

608-4.1 Installation Standards

Glazing shall comply with the applicable requirements identified in Appendix E.

609 FINISH MATERIALS

609-1 FINISH FLOORING, RIGID

The products used shall be installed in accordance with the manufacturer's instructions and/or recommendations.

609-2 RESILIENT FLOORING

Resilient flooring shall be installed over a suitable underlayment and in compliance with the recommendations of the manufacturer.

609-3 PAINTING

609-3.1 Application

- a. Application of paints, stains, or other coating systems shall be in strict accordance with manufacturer's directions.
- b. Additional coats may be required if the finish surface does not provide coverage or hiding that is acceptable to the HUD Field Office.

609-3.2 Exterior Wood Surfaces

Exterior wood surfaces shall be finished as follows:

- a. Wood Siding, Millwork and Trim

- (1) Knots, resinous wood, and nail holes shall be sealed with a prepared sealer or aluminum paint prior to puttying and priming. Any nail holes or cracks in surfaces to be painted shall be filled with putty.
- (2) A prime coat shall be applied to all surfaces to be painted before or immediately after installation. Primer shall be formulated specifically for application to unfinished wood. Finish coats formulated to serve as primers may be used.
- (3) One of the following finish systems shall be applied. Coverage shall be that which will provide at least the minimum thickness recommended by the manufacturer.
 - (a) Oil paint systems.
 - (b) Latex paint systems.
 - (c) Pigmented stains as per manufacturer's directions.
 - (d) Clear penetrating preservatives or water repellent finishing systems.

(4) The top and bottom of exterior wood doors, casement sash, awning sash and the bottom of double hung sash shall receive two coats of paint or sealer.

(5) Prior to erection, all edges of vertical siding shall be sealed with a heavy coat of house paint primer, water repellent stain, exterior aluminum house paint or sealer. Wood batten strips shall be backed-primed or sealed.

b. Wood Shingles, Shakes, Roughsawn Siding.

Two coats of oil stain, pigmented oil stain or an oil shingle paint shall be applied.

c. Hardboard and Softwood Plywood Siding.

These sidings shall be finished in accordance with the manufacturer's direction.

d. Wood Porch Floors and Decks.

One coat of primer and two coats of floor and deck enamel designed for exterior use shall be applied. Joints between floor and wall shall be caulked.

e. Unfinished Surfaces.

Shingles and board siding of vertical grain cedar, redwood and baldcypress may be left unfinished.

609-3.3 Exterior Concrete Masonry Units or Concrete Brick

a. At least two coats of masonry paint shall be applied.

b. Concrete masonry units or concrete brick, except small areas of foundation walls, shall be painted to provided a water resistant finish.

High density concrete brick or solid split block forming the outer face of double unit walls (veneer, cavity walls, etc.) may be left unpainted when acceptable to the HUD Field Office.

609-3.4 Exterior Metal

a. Galvanized Steel or Iron

- (1) Field painting shall consist of two coats. One coat shall be a primer formulated specifically for galvanized surfaces, and the second coat shall be a finish coat. A finish coat formulated to serve as a primer may be used as the first coat.

b. Steel, Iron or Terne Plate

- (1) Steel or iron, except stainless steel, weathering steels, or steel treated with coatings to provide corrosion resistance, shall be painted.
- (2) A rust inhibitive primer and a finish coat shall be applied.

609-3.5 Interior Wood Surfaces

a. Millwork and Trim

- (1) All mill work and trim, including windows; interior doors; window, door and base trim; paneling and closet shelving and trim shall be finished by painting or natural finishing.

- (2) Painting

If the surface is open grain wood, it shall be filled or sealed to prevent the grain from rising. Surfaces shall be treated with a primer. One or more finish coats shall be applied to provide a smooth surface and good hiding.

- (3) Finished Material

Natural finishes include stain-wax, stain followed by one or more coats of varnish, clear coats of varnish with or without wiped paint undercoats or oil and wax finishes.

b. Wood Floors

- (1) If flooring is open grain wood, one coat of filler shall be applied. All excess shall be wiped off.
- (2) Flooring shall be finished with:
 - (a) One or two coats of penetrating sealer and one coat of wax; or
 - (b) Two coats of varnish and one coat of wax; or
 - (c) Two coats of polyurethane; or
 - (d) One or more coats of factory-applied finish.

609-3.6 Interior Plaster and Gypsum - Walls and Ceilings

- a. Plaster surfaces may be painted, covered or left unfinished, except for surfaces of kitchens and baths. If painted, a finished coat shall be applied over a primer-sealer, unless finish coats are of the self-priming type.
- b. Gypsum wallboard shall be covered. If painted, one coat of wallboard sealer shall be applied unless finish coats are of the self-sealing type. Two finish coats shall be applied over the sealer. One finish coat, except in kitchen and baths, may be acceptable if good coverage is obtained.

609-3.7 Interior Metal

Non-ferrous metals or wrought iron may be painted or left unfinished. Other metals shall be painted in accordance with 609-3.4.

609-3.8 Interior Concrete Floors

- a. If painted, at least two coats of resin emulsion paint, a solvent rubber paint or a floor and deck enamel shall be applied. If oil paint is used, the surface shall be neutralized before painting.
- b. A coat of wax shall be applied over paint, stain or an integral finish.

609-4 WALL COVERINGS

Covering material shall be secured to a suitable base in accordance with the manufacturer's directions.

609-5 OTHER FINISHES

609-5.1 General

Other finishes shall be installed in accordance with the manufacturer's directions.

609-5.2 Carpeting and Cushioning

Carpeting and cushioning shall be installed in accordance with the Specifiers Guide for Contract Carpet Installation, published by the Carpet and Rug Institute. The carpet shall be installed over one of the following suitable underlayments:

- a. A finish floor as provided and described in Section 509 and 609;
- b. A troweled concrete floor;
- c. A plywood subfloor. The top ply of plywood shall be at least "C plugged" grade;
- d. A plywood, hardboard or particleboard underlayment over any other subfloor described in this paragraph.
- e. Other materials where they provide a smooth, hard, durable surface.

611 EQUIPMENT

611-1 KITCHEN AND VANITY CABINETS

611-1.1 General

- a. All manufactured factory finished cabinets shall comply with ANSI A161.1-86, Recommended Minimum Construction and Performance for Kitchen and Vanity Cabinets, or with an equivalent standard.

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611-1.1 General - Continued

All cabinets shall bear the label of an independent agency that maintains continuous control over the testing and inspection of the cabinet. The label shall identify the manufacturer's name or symbol and indicate compliance with the applicable standards.

- b. Construction and installation of job and custom built cabinets shall be acceptable to the HUD Field Offices. These cabinets shall be equivalent in quality and construction to cabinets meeting ANSI A161.1-86.

611-1.2 Counter Tops

- a. The top material shall be securely bonded to a reinforced steel core, to 5/8 in. plywood, or to any other equivalent material.
- b. Top material shall be phenolic laminate, vinyl plastic covering, ceramic tile, stainless steel or other material suitable for its intended use. At least a 3 in. back and end splash shall be provided against all abutting vertical surfaces which are not water and grease resistant. When a back splash is omitted, the joints at the juncture of the counter top and vertical surfaces shall be tight and sealed.
- c. All edges, including the sink and any built-in surface units, shall have a non-corrodible metal molding or other suitable edging.

613 SPECIAL CONSTRUCTION

613-1 FACTORY-PRODUCED (MODULAR OR PANELIZED) HOUSING

613-1.1 Structural Features

HUD Handbook 4950.1, Technical Suitability of Products Program Processing Procedures, describes procedures to be followed in order to obtain acceptance of structural features of housing not covered by the MPS.

613-1.1 Non-Structural Features

These features include methods of construction, systems, sub-systems, components, materials and processes which are not covered by the MPS. See HUD Handbook 4950.1 for procedures to be followed in order to obtain acceptance of non-structural components or materials.

613-2 SWIMMING POOLS

Where semi-private swimming pools are to be built, their design and construction shall comply with ANSI/NSPI 1-91, American National Standard for Public Swimming Pools.

614 ELEVATORS

614-1 MINIMUM SERVICE ELEVATOR SIZE (Minimum for Ambulance Stretchers) See ANSI A17.1.

Inside car size	-	6'-8" wide by 4'-3" deep
Door size	-	3'-6" wide by 7'-8" high
Door type	-	Single slide
Capacity	-	2500 lbs.

615 MECHANICAL

615-1 SPECIAL PIPING SYSTEM

Gas transmission systems shall be installed to obtain at least the level of safety performance required by 49 CFR, Part 192, entitled "Transportation of Natural or Other Gas by Pipeline." Liquid petroleum pipelines shall conform to 49 CFR, Part 195.

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615-2 WATER SUPPLY SYSTEM

615-2.1 General

Each living unit shall be provided with a continuing and sufficient supply of safe water under adequate pressure and of appropriate quality for all household uses, and one that will not impair the functioning or durability of the plumbing system or attachments.

615-2.2 Source of Water Supply

- a. Whenever feasible, connection shall be made to a publicly owned or publicly controlled water supply system that is adequate to serve the demands of the project.
- b. When a public system is not available, connection shall be made to a community system acceptable to the HUD Field Office and approved by the local health authority. The chemical and bacteriological standards of the health authority shall apply. In the absence of such standards, the maximum contaminant levels of the Environmental Protection Agency shall apply.
- c. Community water supply systems shall comply with HUD Handbook 4940.2.

615-3 SEWAGE DISPOSAL SYSTEM

615-3.1 General

Each living unit shall be provided with a water-carried system adequate to dispose of domestic wastes in a manner which will not create a nuisance or endanger the health of the occupants or the public.

615-3.2 Method of Sewage Disposal

- a. Whenever feasible, connection shall be made to a publicly owned or publicly controlled system that is adequate to serve the needs of the project.

- b. When a publicly owned or publicly controlled system is not available or connection to or service therefrom is not feasible, connection shall be made to a community system which complies with HUD Handbook 4940.3 Rev.1-1992 and is acceptable to local regulatory bodies. Evidence of approval by such authorities for each completed system shall be submitted to the HUD Field Office.